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PREDICTION OF SUCCESS IN AIRBORNE TRAINING

Frederick N. Dyer and William P. Burke

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ARI FIELD UNIT AT FORT BENNING, GEORGIA

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PREDICTION OF SUCCESS IN AIRBORNE TRAINING

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**Army Project Number
2Q283731A792**

**Soldier Values, Physical Capability and
Combat Effectiveness**

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FOREWORD

This research was conducted as an in-house effort by the ARI Field Unit at Fort Benning under Project 2Q263731A792. The research was also responsive to a request from the Airborne Department of the U.S. Army Infantry School to examine the relationships between physical fitness of Airborne trainees and success, injuries and fear in Airborne training. Much excellent assistance in data collection and data processing was obtained from a series of junior officers who were assigned for brief periods to the ARI Field Unit while awaiting leadership training at USAIS.


JOSEPH ZEIDNER
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PREDICTION OF SUCCESS IN AIRBORNE TRAINING

BRIEF

Requirement:

This research is responsive to a request from the Airborne Department of the U.S. Army Infantry School to evaluate the relationship between physical fitness and success, injuries and fear in Airborne training. If no relationship were found to exist between physical fitness and training success, this might mean that current physical fitness requirements for entry into Airborne training are inappropriately high. If a very strong relationship were found to exist between fitness and success, this might imply that requirements are too low and that many soldiers are allowed to enter Airborne training who are not physically qualified. The research also bears on training for and prediction of combat performance. Although the stresses of Airborne training undoubtedly are much less than any combat mission, Airborne training may still provide a model of combat. For this reason, predictors of Airborne training success may be expected to have predictive validity for the important variable of combat performance. To the extent that such predictor variables (e.g., physical fitness) are subject to change through training, performance of combat soldiers might also be improved.

Procedure:

For the most part, standard physical fitness data and standard Airborne training outcome data were intercorrelated in this research. The major sample consisted of 3,812 Airborne students who attended the course from July to November 1978. The sample was made up of 2,187 enlisted personnel, 362 officers and 1,263 ROTC and Military Academy cadets. There were 3,611 males and 201 females. A subset of 358 of the enlisted males received additional testing on their physical fitness (Harvard Step Test, pushups and chinups).

Findings:

Trainee fitness, particularly running performance, was a strong predictor of Airborne training success. Success in Airborne training was also strongly associated with sex of the trainee and with the cadet, officer and enlisted status of the trainee. Males were much more apt to avoid disqualification or turnback than females and cadets were more apt to succeed than officers who, in turn, were more apt to succeed than enlisted personnel. Much of the variance in training success associated with sex and with cadet, officer or enlisted status was accounted for by the physical fitness differences found between and among these groups. In particular, there was little overlap in the distributions of one-mile run times for males and females. Even differences observed in success rates for the different Advanced Individual Training centers that provided enlisted trainees were correlated with the average run times for trainees from these different centers. Poor running performance was related to training failures for reasons of low motivation, low fitness and injuries incurred during morning runs. These reasons account for the majority of training failures. Jump-related injuries were not related to running performance.

Utilization:

The strong association of trainee fitness with Airborne training success occurred despite a fairly limited range of trainee fitness levels. Any reduction of existing standards for physical performance for entering Airborne trainees would be expected to increase the rate of failure for the primary failure reasons of low fitness, low motivation and running-related injuries. Differences found between AIT centers in the success rates of their products could probably be eliminated by increasing physical fitness training at centers with low success.

PREDICTION OF SUCCESS IN AIRBORNE TRAINING

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PREDICTION OF SUCCESS IN AIRBORNE TRAINING

INTRODUCTION

Several studies predicting success in Army Airborne training have been conducted since training began in 1941 (e.g., Fuchs, Weinert and Frankfeldt, 1952; Stouffer, et al., 1949; Walk, 1956; 1959). The present study included several of the same variables as earlier studies in order to control for these variables and also to test for their continuing relevance. However, the major thrust of this research was to provide data on the relation of performance on specific physical fitness test events to success in Airborne training.

This relationship between physical fitness and Airborne training success is currently of interest for several reasons. One is that some pressure exists to reduce the physical fitness requirements for entry into Airborne training. This research would show how the existing range of fitness levels of trainees relates to Airborne training success and to different classes of training failure such as injuries. If the trainees who are "low" in fitness, fare as well as their high-fitness colleagues, this would be evidence of an inappropriate emphasis on fitness.

Another major reason is that Airborne training is one of the most stressful activities of soldiers during peacetime. Since considerable variation exists in the physical fitness of these soldiers, this research should provide evidence regarding whether or not cardiovascular fitness and strength can predict success in Airborne training and, by extension, in stressful combat activities.

The research also related physical fitness measures and Airborne training success to the sex of the trainee; to enlisted, officer or cadet status of the trainee; and to the Advanced Individual Training (AIT) center from which the enlisted trainee had come. Airborne training personnel recognized that trainee group differences existed, both in success and physical performance. Accurate description of these group differences in training success and fitness was another study purpose. It was also expected that some of the differences in training success among these different groups of trainees might be directly related to differences in their physical fitness. If this were true for the AIT source of the trainee, it would indicate that increasing the amount of fitness training at that AIT center could improve the chances for success of the trainees from that center.

Walk (1959) included the total physical fitness test score as one variable in his study of Airborne training success. He found only a small (but significant) association of higher PT scores with higher success rates. However, Walk's study probably provided an underestimate of this relationship for two reasons. One is that strength and cardiovascular fitness measures were confounded by summing performance scores for all measures. The other, and more serious problem, is that Army Fitness Test "point" scores eliminate much of the variance that exists in actual performance. For example, a young soldier receives the maximum 100 points for any two-mile run time less than 14 minutes and 9 seconds. Yet over a third of the males entering Airborne training run faster than this pace.

Walk (1959) found a fairly strong relationship between sports participation and Airborne training success. Since any relationship of fitness to success might be mediated by sports participation, such data were also collected from the trainees included in our research.

METHOD

Sample

The sample consisted of 3,812 Airborne students who attended the course from July to November 1978. The sample was made up of 2,187 enlisted personnel, 362 officers and 1,263 ROTC and Military Academy cadets. There were 3,611 males and 201 females. A subset of 358 enlisted male trainees from the total sample received additional testing on a Modified Harvard Step Test, pushups and chinups. This subset of trainees also were given a battery of psychological tests and a fear scale. The results of this psychological testing will be described in a subsequent report.

Background Measures

Data were collected at in-processing for each trainee on sex, age, rank/grade, marital status, number of dependents, height, weight, years of education and component (Regular Army, National Guard, etc.). For officers, source of commission was obtained and for enlisted personnel, GT score. Other data routinely collected were sports "participated in during high school or since" and the location of the Advanced Individual Training center of the junior enlisted personnel.

Physical Fitness Measures

The majority of physical fitness data came from either the Advanced Physical Fitness Test (APFT), Basic Physical Fitness Test (BPFT), or Women's Physical Fitness Test (WPFT). Test data were typically collected a few weeks prior to Airborne training at the previous unit of the trainee. The majority of male data came from the APFT. Scores obtained in this test are the time to complete the inverted crawl, number of situps in one minute, number of rungs traversed on a horizontal overhead ladder, time for a "run, dodge and jump" event, and the time required to run two miles (FM 21-20, 1973). BPFT scores were the same except the run was only one mile. Women's test scores were the time for a "shuttle run", number of situps in one minute, number of pushups (from the knees) in one minute, time for the "run, dodge and jump," and time for a one-mile run (FM 35-20, 1973). Physical fitness test data were not available for 1,134 trainees. The bulk of these were cadets and students from other services, for whom the Army Test was unavailable.

Additional fitness data were obtained each week from 25 enlisted male trainees just prior to commencement of their Airborne training. Trainers selected these 25 personnel from all enlisted personnel available for details. No bias in their selection is known and they probably are representative of these soldiers who report early for training. Number of pushups in one minute, number of chinups in one minute and performance on a modified Harvard Step Test were measured for a total of 358 such personnel. The Step Test procedure was the modification by Tuxworth and Shahnawaz (1977) which has produced correlations in the high 80s between heart rate (adjusted by weight) and physical work capacity as measured by bicycle ergometry.

Airborne Training Outcome

Data were routinely obtained regarding whether the trainees completed Airborne training without delays, were permanently disqualified from Airborne training, were temporarily disqualified from Airborne training, or were turned back one or more weeks to repeat training. Reasons for permanent disqualification, temporary disqualification and turnbacks were also obtained. When injuries produced delays in training, an attempt was made to identify the nature of the injury and the training activity that produced it. Unfortunately, reasons for injuries and type of injury often were not available due to problems in obtaining such data from busy medical personnel.

Procedure

All trainees completed a Basic Data Form during their initial processing upon arriving at the Airborne School. The Basic Data Form is included in this report as Appendix A. They copied the fitness test raw scores from the test scorecards which were in their personnel folders. Enlisted personnel also copied their GT score from their records (officers do not usually have this "IQ" measure).

Most junior enlisted personnel complete a week of details called "zero week" prior to the actual three-week Airborne course. During each zero week, 25 of these male personnel were tested on the number of chinups they could perform in one minute, the number of pushups they could perform in one minute and a modified Harvard Step Test. These soldiers worked in pairs with one performing the test event while the other counted repetitions or measured pulse rate (step test). After one member of the pair had completed performance on each test event, they switched roles with the former performer now recording data and vice versa.

In the step test, a soldier stepped onto, then back down from a 16-inch bench at 15 such step-cycles per minute for a period of five minutes. Thirty seconds after stopping, his "buddy" counted (and recorded) the stepper's pulse for 30 seconds. Thirty seconds were allowed to elapse and the pulse was counted again during the next 30 seconds. After 30 more seconds the pulse was counted for another 30-second period. After both soldiers had completed the 15 step-cycle test, another five-minute stepping period occurred, this time at 25 step-cycles per minute. Pulse was again counted for three 30-second periods, beginning 30 seconds, 90 seconds and 150 seconds following completion of stepping.

Method of Analysis

Physical-fitness-test scores were analyzed in analyses of variance with independent variables of training outcome, trainee group (enlisted, officer or cadet), trainee sex and AIT location. Multiple regression was used to estimate the total contribution of variables such as different physical-fitness-event scores to prediction of training success.

RESULTS

Sex, Training Success and Physical Performance

Males and females showed highly significant differences in the rate of success/failure in Airborne training during the period of this study. Whereas 71 percent of male trainees completed training without problems, only 42 percent of females completed training without any delay or disqualification. Thirteen percent of males completed training with one or more turnbacks and 16 percent of males left Fort Benning without completing training. For females these figures were 22 and 36 percent, respectively. A Chi-square analysis of these three training outcomes versus sex produced a Chi-square of 169 ($p < .001$).

The higher success rate for males in Airborne training may be related to the parallel pattern of differences in physical performance for the two sexes. Both groups provided data on the mile run (151 females and 394 males). The average run time for females was 8.42 minutes. For the males the average run time was 7.00 minutes. This difference was highly significant ($F(1,543)=367$; $p < .0001$). The percentages of males and females running the mile for different 30-second time periods are presented in Figure 1. It can be seen that there is little overlap between the distribution of run times for males and the distribution for females.

Trainee Group and Training Success

Officer, enlisted or cadet status of the Airborne trainee was also a powerful predictor of Airborne training success. For cadets, 86 percent were able to complete training without delay or disqualification. This figure was 67 percent for officers and 61 percent for enlisted trainees. Enlisted personnel were much more apt to be permanently disqualified for "low motivation" (10.7%) than were cadets or officers (less than one percent for each group). Cadets were restricted in the amount of time available for training and often left without finishing when medical reasons or other factors delayed their training. Enlisted and officer personnel were more apt to be turned back and to eventually complete training when similar problems arose.

Trainee Group and Physical Performance

Cadets typically performed at higher levels on all physical fitness test events than did either officers or enlisted personnel. This finding held for both male and female trainees. Average performance for the different groups of male trainees on Advanced Physical Fitness Test events are presented in Table 1, along with the F-ratios and significance levels from the analysis of variance for each event. Average performance for the different groups of female trainees for their test events are presented in Table 2, again with F-ratios and significance levels. In all instances, except the female shuttle run, the average performance of cadets was significantly better than the average performances for the enlisted and officer groups.

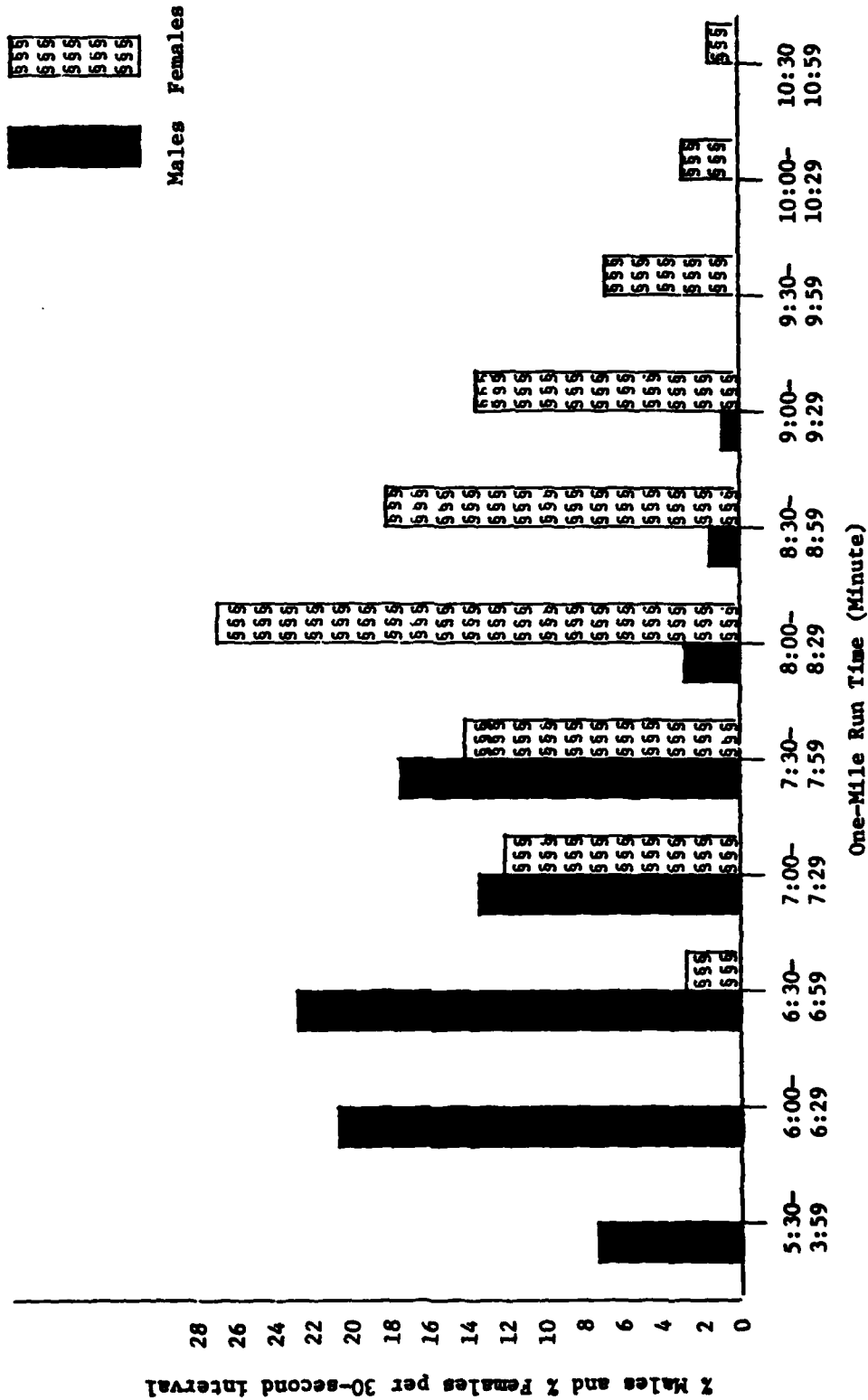


Figure 1. Comparison of male and female run performance.

TABLE 1
AVERAGE PERFORMANCE FOR DIFFERENT TRAINEE
GROUPS ON APFT EVENTS (MALES)

PHYSICAL FITNESS TEST EVENT	GROUP			F-RATIO/ SIGNIFICANCE
	ENLISTED	OFFICER	CADET	
Inverted Crawl (Sec.)	17.9 (N = 1475)	17.1 (N = 201)	16.4 (N = 601)	F (2, 2274) = 37 p < .0001
Situps	43.1 (N = 1650)	45.6 (N = 234)	47.9 (N = 653)	F (2, 2534) = 46 p < .0001
Horizontal Ladder (No. of rungs)	64.9 (N = 1487)	62.0 (N = 212)	68.3 (N = 583)	F (2, 2279) = 11.2 p < .0001
Run, Dodge & Jump (Sec.)	22.2 (N = 1480)	21.3 (N = 210)	21.0 (N = 592)	F (2, 2279) = 66 p < .0001
Two-mile Run (Min.)	15.3 (N = 1442)	15.6 (N = 213)	14.6 (N = 614)	F (2, 2266) = 32 p < .0001

TABLE 2
AVERAGE PERFORMANCE FOR DIFFERENT TRAINEE GROUPS
ON WPFT EVENTS (FEMALES)

PHYSICAL FITNESS TEST EVENT	GROUP			F-RATIO/ SIGNIFICANCE
	ENLISTED	OFFICER	CADET	
Pushup	37.1 (N = 75)	35.2 (N = 17)	42.9 (N = 69)	F (2, 158) = 12.1 p < .0001
Run, Dodge & Jump (Sec.)	25.1 (N = 57)	24.4 (N = 17)	23.8 (N = 67)	F (2, 138) = 3.2 p < .05
Shuttle Run (Sec.)	24.5 (N = 57)	24.3 (N = 15)	23.1 (N = 65)	F (2, 134) = 2.4 p = .09
Female Situp	39.0 (N = 75)	40.5 (N = 17)	44.3 (N = 69)	F (2, 158) = 7.1 p < .01
One-mile Run (Min.)	8.7 (N = 69)	8.22 (N = 16)	8.18 (N = 69)	F (2, 151) = 7.9 p < .001

Physical Performance and Airborne Training Success

The parallel findings of higher fitness and higher training success for males than females suggests that fitness and training success are related. The same conclusion could be drawn from the better success of cadets over other groups on physical fitness test events and also in Airborne training. To identify whether fitness by itself predicts success in Airborne training requires separate analyses of fitness and training success for groups that do not differ in sex or in enlisted, officer or cadet status.

For these analyses, success was defined as completing Airborne training without any turnback, temporary disqualification or permanent disqualification. Failure was defined as any other outcome. Reasons for "failure" were administrative problems, medical problems, low physical fitness, failure to qualify at the mock tower, failure to qualify on the swing-landing-trainer and low motivation. The six different failure reasons plus "success" provided a factor of seven levels which was used in a one-way analysis of variance to assess performance for each different physical fitness test event.

Average performance of enlisted males on the five events of the APFT are presented in Table 3 with a breakdown by success/failure. For almost every event, performance was higher for the "success" group that had no turnbacks or disqualifications. Differences between this group and the medical, low fitness and low motivation "failure" groups were invariably significant. However, mock-tower and swing-landing-training "failures" typically did not differ significantly from the "success" group.

Tables 4 and 5 present comparable data for officers and cadets, respectively. The same pattern of highest performance for the "success" group appeared throughout. Only for the two-mile run, however, was the difference between the success and failure group highly significant. The greatly reduced numbers for the male officer and cadet groups probably account for the fewer significant differences in fitness test performance among success/failure outcomes for these groups than for the large enlisted group. "Low motivation" occurred very rarely for those groups and this category of failure was not included in these analyses.

Data for female enlisted personnel are presented in Table 6 and for female cadets in Table 7 (only 16 female officers had fitness data). Females in the success category were typically better performers than those in failure categories and this was particularly true for the mile run. Again small numbers of trainees probably accounted for the deviations from the typical pattern shown on all events by enlisted males. Categories of failure are not included in those analyses unless at least five trainees failed for that reason.

Success and Failure as a Function of Run Time.

The relationship between physical performance and training success of male trainees is also illustrated in Figure 2. Rates of failure for medical reasons, low physical fitness and low motivation are plotted against time to run two miles. The slowest category of run times at the right of the figure (18:00 to 19:59) still includes the 19:07 time which provides a soldier under 26 years of age with the 60 points needed to pass the event.

TABLE 3
AVERAGE PHYSICAL FITNESS TEST PERFORMANCE AS A FUNCTION
OF TRAINING OUTCOME FOR MALE ENLISTED TRAINEES

PHYSICAL FITNESS TEST EVENT	TRAINING OUTCOMES							F-RATIO/ SIGNIFI- CANCE	ETA- SQUARED
	NO TURNBACK OR DISQUALIFI- CATION	ADMINIS- TRATIVE PROBLEM	MEDICAL PROBLEM	LOW PHYSICAL FITNESS	FAILED MOCK TOWER	FAILED SWING LANDING TRAINER	LOW MOTIVATION		
Inverted Crawl (Sec.)	17.5 (N = 986)	18.0 (N = 55)	19.2 (N = 93)	20.8 (N = 35)	18.2 (N = 53)	18.4 (N = 85)	18.5 (N = 152)	F(6, 1452) = 11.2 p < .0001	.04
Situps (No. in one minute)	44.0 (N = 1085)	40.4 (N = 74)	40.5 (N = 108)	37.3 (N = 45)	43.2 (N = 57)	43.2 (N = 90)	41.7 (N = 172)	F(6, 1624) = 8.5 p < .0001	.03
Horizontal Ladder (No. of Rungs)	66.6 (N = 987)	61.0 (N = 58)	60.7 (N = 95)	50.1 (N = 37)	64.5 (N = 53)	65.8 (N = 85)	61.7 (N = 155)	F(6, 1463) = 10.3 p < .0001	.04
Run, Dodge & Jump (Sec.)	22.1 (N = 993)	22.3 (N = 59)	22.4 (N = 93)	23.1 (N = 32)	21.9 (N = 56)	22.3 (N = 79)	22.6 (N = 149)	F(6, 1454) = 3.3 p < .01	.01
Two-mile Run (Min.)	15.0 (N = 951)	15.9 (N = 62)	15.6 (N = 86)	17.3 (N = 38)	15.2 (N = 51)	15.3 (N = 79)	13.9 (N = 154)	F(6, 1414) = 21.8 p < .0001	.08

TABLE 4
AVERAGE PHYSICAL FITNESS TEST PERFORMANCE AS A FUNCTION
OF TRAINING OUTCOME FOR MALE OFFICER TRAINEES

PHYSICAL FITNESS TEST EVENT	TRAINING OUTCOMES						F-RATIO/ SIGNIFI- CANCE	ETA- SQUARED
	NO TURNBACK OR DISQUALIFI- CATION	ADMINIS- TRATIVE PROBLEM	MEDICAL PROBLEM	LOW PHYSICAL FITNESS	FAILED MOCK TOWER	FAILED SWING LANDING TRAINER		
Inverted Crawl (Sec.)	16.5 (N = 138)	19.3 (N = 8)	19.4 (N = 25)	17.4 (N = 15)	18.1 (N = 6)	17.6 (N = 5)	F(5, 191) = 3.9 p < .01	.10
Situps (No. in one minute)	46.2 (N = 160)	40.0 (N = 10)	43.6 (N = 28)	44.3 (N = 14)	43.1 (N = 7)	48.7 (N = 9)	F(5, 222) = 1.4 N.S.	---
Horizontal Ladder (No. of Rungs)	63.1 (N = 144)	60.9 (N = 7)	58.6 (N = 25)	59.4 (N = 14)	57.9 (N = 7)	63.3 (N = 9)	F(5, 200) = .6 N.S.	---
Run, Dodge & Jump (Sec.)	21.0 (N = 143)	22.0 (N = 8)	22.3 (N = 24)	22.1 (N = 14)	21.8 (N = 6)	21.4 (N = 9)	F(5, 148) = 4.4 p < .001	.11
Two-mile Run (Min.)	15.3 (N = 147)	15.9 (N = 7)	16.7 (N = 26)	17.5 (N = 13)	14.9 (N = 8)	15.0 (N = 7)	F(5, 202) = 7.2 p < .0001	.15

TABLE 5
AVERAGE PHYSICAL FITNESS TEST PERFORMANCE AS A FUNCTION
OF TRAINING OUTCOME FOR MALE CADET TRAINEES

PHYSICAL FITNESS TEST EVENT	TRAINING OUTCOMES						F-RATIO/ SIGNIFI- CANCE	ETA- SQUARED
	NO TURNBACK OR DISQUALIFI- CATION	ADMINIS- TRATIVE PROBLEM	MEDICAL PROBLEM	LOW PHYSICAL FITNESS	FAILED MOCK TOWER	FAILED SWING LANDING TRAINER		
Inverted Crawl (Sec.)	16.3 (N = 507)	16.9 (N = 25)	16.5 (N = 18)	18.0 (N = 14)	16.3 (N = 25)	15.9 (N = 8)	F(5, 591) = 1.4 N.S.	—
Situps (No. in one minute)	48.3 (N = 151)	44.7 (N = 25)	42.1 (N = 24)	44.0 (N = 16)	49.8 (N = 25)	46.8 (N = 8)	F(5, 643) = 4.4 p < .001	.03
Horizontal Ladder (No. of Rungs)	68.4 (N = 492)	64.7 (N = 23)	68.1 (N = 17)	61.4 (N = 14)	70.8 (N = 25)	75.4 (N = 8)	F(5, 573) = 1.6 N.S.	—
Run, Dodge & Jump (Sec.)	20.9 (N = 498)	21.0 (N = 25)	21.3 (N = 18)	21.9 (N = 14)	21.3 (N = 25)	21.3 (N = 8)	F(5, 582) = 1.7 N.S.	
Two-mile Run (Min.)	14.5 (N = 520)	15.3 (N = 25)	15.2 (N = 18)	16.3 (N = 13)	14.8 (N = 25)	14.9 (N = 8)	F(5, 603) = 6.4 p < .0001	.05

TABLE 6
AVERAGE PHYSICAL FITNESS TEST PERFORMANCE AS A FUNCTION
OF TRAINING OUTCOME FOR FEMALE ENLISTED TRAINEES

PHYSICAL FITNESS TEST EVENT	TRAINING OUTCOMES				F-RATIO/ SIGNIFI- CANCE	ETA- SQUARED
	NO TURNBACK OR DISQUALIFI- CATION	MEDICAL PROBLEM	LOW PHYSICAL FITNESS	LOW MOTIVATION		
Shuttle Run (Sec.)	22.1 (N = 11)	24.4 (N = 17)	24.6 (N = 9)	23.0 (N = 10)	F (3, 43) = 10.5 p < .0001	.42
Situps	40.4 (N = 11)	38.3 (N = 28)	38.1 (N = 13)	40.8 (N = 13)	F (3, 61) = .4 N.S.	---
Push-ups	38.0 (N = 11)	36.0 (N = 27)	35.5 (N = 12)	37.3 (N = 13)	F (3, 59) = .3 N.S.	---
Run, Dodge & Jump (Sec.)	23.3 (N = 11)	25.7 (N = 19)	25.4 (N = 11)	24.7 (N = 10)	F (3, 47) = 5.2 p < .01	.33
One-mile Run (Min.)	8.24 (N = 12)	8.82 (N = 24)	9.07 (N = 12)	8.79 (N = 13)	F (3, 57) = 2.3 p = .09	.11

TABLE 7
AVERAGE PHYSICAL FITNESS TEST PERFORMANCE AS A FUNCTION
OF TRAINING OUTCOME FOR FEMALE CADET TRAINEES

PHYSICAL FITNESS TEST EVENT	TRAINING OUTCOMES				F-RATIO/ SIGNIFI- CANCE	ETA- SQUARED
	NO TURNBACK OR DISQUALIFI- CATION	ADMINIS- TRATIVE PROBLEM	MEDICAL PROBLEM	LOW PHYSICAL FITNESS		
Shuttle Run (Sec.)	23.0 (N = 36)	21.7 (N = 5)	23.3 (N = 11)	23.8 (N = 10)	F (3, 58) = 2.7 p = .05	.12
Situps	44.2 (N = 40)	50.2 (N = 5)	42.4 (N = 11)	43.9 (N = 10)	F (3, 62) = 1.9 N.S.	---
Pushups	43.8 (N = 40)	46.6 (N = 5)	40.0 (N = 11)	41.5 (N = 10)	F (3, 62) = 1.9 N.S.	---
Run, Dodge & Jump (Sec.)	24.0 (N = 37)	23.2 (N = 5)	23.7 (N = 11)	23.4 (N = 10)	F (3, 59) = .1 N.S.	---
One-mile Run (Min.)	7.9 (N = 39)	8.2 (N = 5)	8.8 (N = 11)	8.7 (N = 10)	F (3, 61) = 6.9 p < .001	.25

% TURN BACKS OR DISQUALIFICATIONS IN AIRBORNE TRAINING

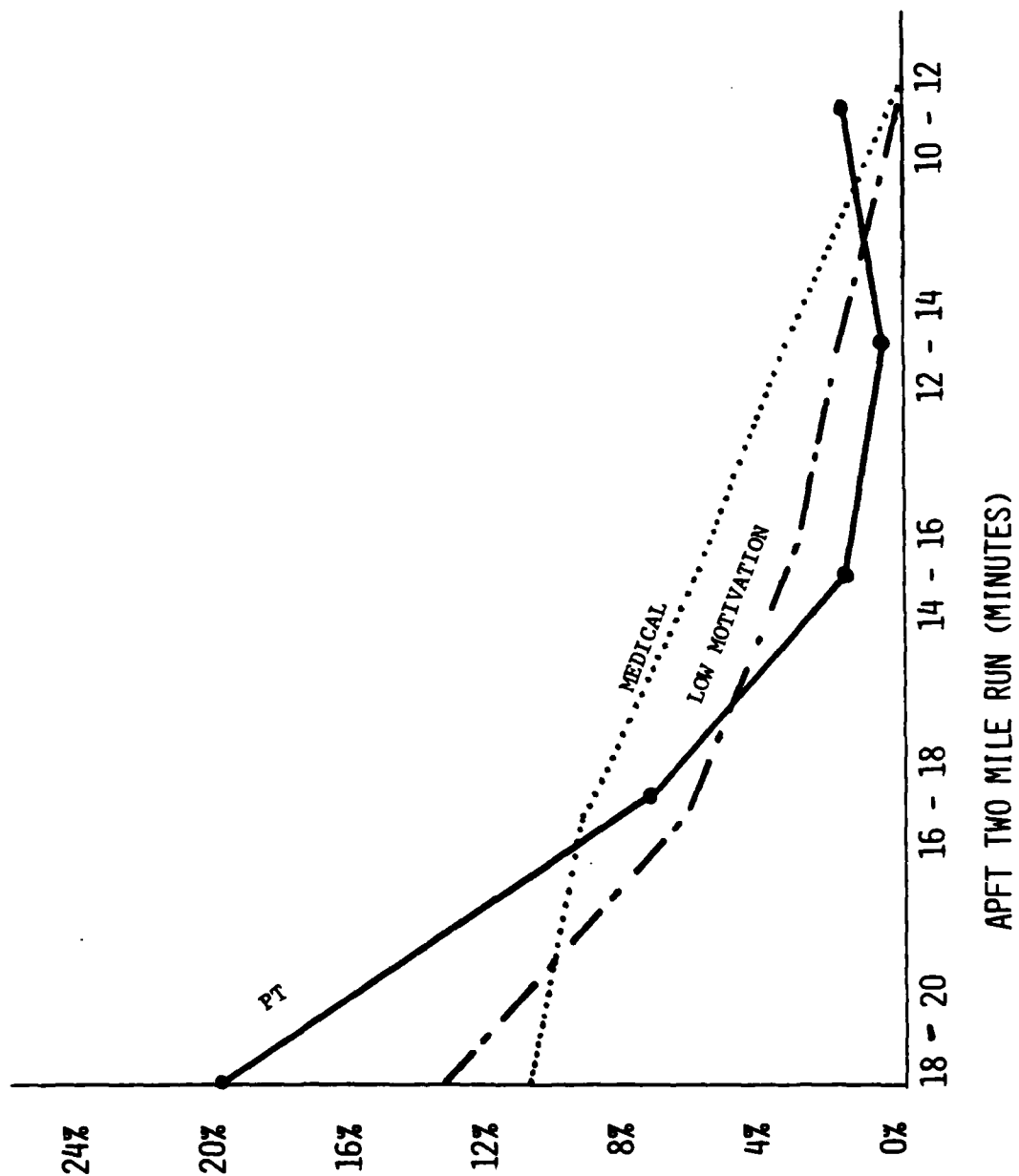


Figure 2. Turnback/Disqualification rates for different run times.

This relationship between fitness and success is also shown by the percentage of male trainees completing Airborne training without delay or disqualification which is illustrated for different two-mile run times and for different trainee groups in Figure 3. Although different levels of run performance are more important than trainees group in predicting training success, it can be seen that trainee group differences favoring cadets over officers and officers over enlisted personnel remain despite blocking on run time. Only nine cadets took longer than 18 minutes to run two miles and the high success rate is probably spurious at this point on the curve.

Figure 4 shows male and female success rates plotted as a function of run time. It can be seen that success rates are nearly identical for males and females who ran the mile in between 7 and 9 minutes. The large male-female training success difference has effectively disappeared with this blocking on pace. The number of females with lower 1-mile run times than 7 minutes and the number of males with longer 1-mile run times than 9 minutes are extremely small and the differences in success rate between males and females running at these fast and slow paces are probably spurious.

Chinups, Pushups and Step-Test Predictions of Success/Failure

Chinups, pushups and step-test data collected on enlisted trainees during "zero week" also were related to success and failure outcomes in Airborne training. These data are presented in Table 8. The step-test data are the sum of pulse counts for the two 30-second periods monitored following the rapid 25-step-cycle per minute rate. These additional physical performance data showed the same pattern of relationship to training success and to the different classes of training failure as was shown by the APFT scores. Since these were all enlisted males who had recently completed Advanced Individual Training, neither sex nor training group status enter into these positive relationships of physical performance to training success.

Airborne Training Injuries and Physical Fitness

The injury-producing activity was known for 96 of the 136 medical turnbacks/disqualifications. Of these, 25 occurred during morning physical training, 37 occurred during the first two weeks of parachute-landing-fall training, 19 occurred during actual jumps from airplanes, and the remaining 15 occurred for reasons of injuries sustained in the barracks, autos or motorcycles or for reasons of illness. Two-mile run times showed significant differences among these different groups despite their low numbers. Highest run times (averaging 16.6 minutes) occurred for the 25 trainees injured during morning physical training. This was significantly different from the 14.9-minute average for all 2,272 trainees with run-time data who completed Airborne training without delay or disqualification ($z=5.3; p<.001$). Persons injured in parachute-landing-fall training during the first two weeks of Airborne training had a two-mile run time averaging 15.0 minutes and persons who were injured in actual jumps from airplanes had an average run time of 15.1 minutes. Neither group's average run time differed significantly from the 14.9-minute average for persons completing airborne training without turnback or disqualification.

% SUCCESSFUL TRAINEES BY GROUP
AND 2-MILE RUN PERFORMANCE

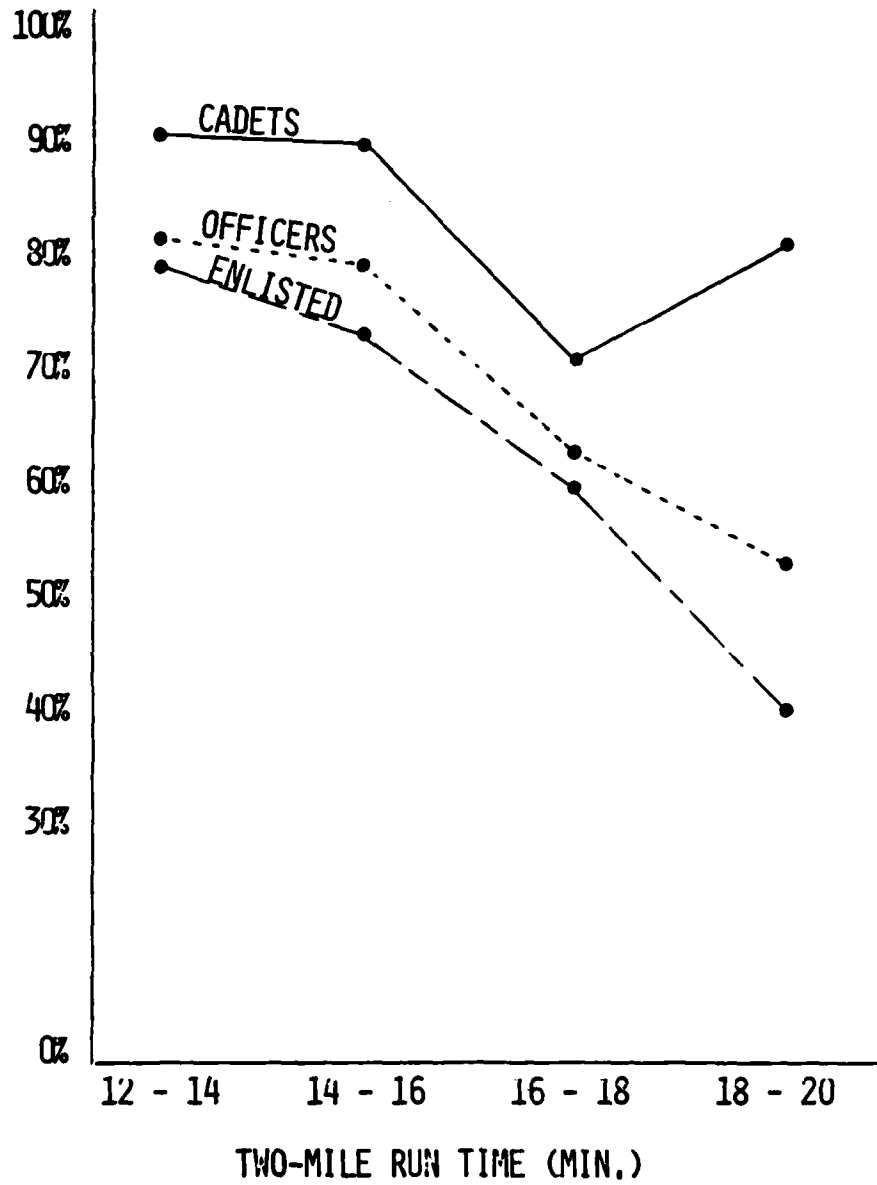


Figure 3. Percent successful trainees by group and 2-mile run performance.

% SUCCESSFUL TRAINEES BY SEX AND 1-MILE RUN PERFORMANCE

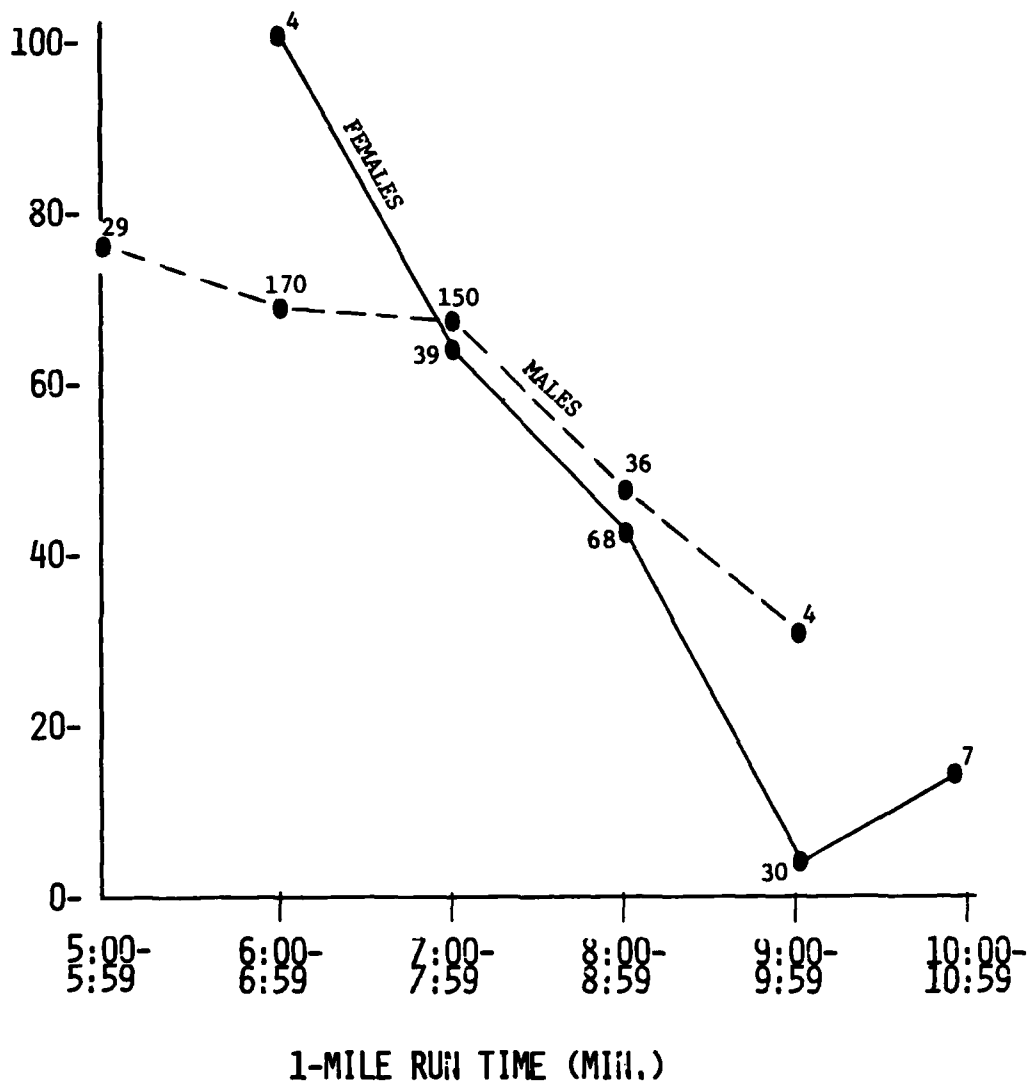


Figure 4. Percent successful trainees by sex and 1-mile run performance.

TABLE 8
AVERAGE PERFORMANCE ON SPECIAL FITNESS TESTS AS A FUNCTION
OF TRAINING OUTCOME FOR MALE ENLISTED TRAINEES

SPECIAL FITNESS TEST EVENT	TRAINING OUTCOMES							F-RATIO/ SIGNIFI- CANCE	ETA SQUARED
	NO TURNBACK OR DISQUALIFI- CATION (N = 220)	ADMINIS- TRATIVE PROBLEM (N = 15)	MEDICAL PROBLEM (N = 17)	LOW PHYSICAL FITNESS (N = 10)	FAILED MOCK TOWER (N = 11)	FAILED SWING LANDING TRAINER (N = 15)	LOW MOTIVATION (N = 31)		
Pushups (No. in 1 min.)	40.3	36.1	39.1	27.3	36.0	38.4	35.8	F (6, 312) = 3.7 p < .01	.065
Chinups (No. in 1 min.)	9.5	10.6	8.0	4.3	9.6	8.8	7.1	F (6, 312) = 4.6 p < .001	.081
Step Test*	100.0	99.3	101.1	112.3	98.2	102.3	109.0	F (6, 312) = 2.6 p < .05	.048

*Pulse total for 30 to 60 and 90 to 120 seconds after Step Test at 25 steps/min. rate.

For the group of 15 trainees who were turned back or disqualified for injuries in the "other" category, a significantly longer average two-mile run time was found than for "successful" trainees. The average for this group was 16.1 and this 1.2-minute difference produced a significant z of 3.7 ($p < .01$).

Advanced Individual Training Center and Airborne Success

The six AIT centers which provided the largest number of trainees were Fort Benning, Fort Gordon, Fort Jackson, Fort Knox, Fort Leonard Wood and Fort Sill. Significant differences were found among these centers in the rate of Airborne training success. The percentages of enlisted male trainees who completed Airborne training without turnback or disqualification are given in Table 9. These ranged from a low of 54.7% for Fort Jackson to 71.0% for Fort Benning. These proportions produced a significant Chi-square of 83 ($p < .001$).

Average two-mile run times also varied among these six posts and these are presented in the third column of Table 9. These differences were highly significant ($F(5,128)=48; p < .001$) and it can be seen that low average run times tend to go with high rates of training success. The correlation between the center's rate of training success and average two-mile run time for the center was found to be $-.81$. The differences in success rate may have been produced by differences in physical preparation of students at the different AIT centers. However, experimental manipulation of such preparation or random assignment of trainees to AIT centers would be needed to show that AIT preparation differences were the cause of the different AIT success rates.

Sport Participation and Airborne Training Success

Walk (1959) found sports participation to be a stronger predictor of Airborne training success than physical fitness. However, problems existed with the compound fitness score used by Walk which have already been discussed. In the present research, data were obtained at in-processing on whether or not the trainee had participated in a number of sports. The percentage of enlisted male trainees who satisfactorily completed Airborne training and the percentage disqualified or turned back for different reasons are presented in Table 10 with a breakdown of the data by sports participation. Cross country, wrestling, track and football participation were associated with success rates above the overall average. Participation in softball, tennis, basketball and swimming were related to lower than average rates of success. Injury "failures" show a weaker inverse relationship with success than failures for "low motivation" and "low fitness."

Sports participation was found to be a poorer predictor of success in Airborne training than APFT scores. A dichotomous criterion of success (no turnbacks or disqualifications) and failure (any turnback or disqualification) was predicted with a multiple R of .30 by the five APFT events. The correlation of just the two-mile run time with this criterion was .24. The multiple R between the nine sports participation indices and success was only .12. Adding sports participation indices to the five APFT events only increased the multiple R from .30 to .31.

TABLE 9

PERCENT WITHOUT DELAYS OR DISQUALIFICATION AND AVERAGE
TWO-MILE RUN TIMES FOR ENLISTED MALES
FROM SIX TRAINING CENTERS

AIT Center	(N)	Percent Without Turnback/Dis- qualification	Average Two-mile Run Time
Fort Benning	(789)	71	14.7
Fort Leonard Wood	(53)	67.9	15.0
Fort Gordon	(222)	66	15.8
Fort Knox	(85)	62.4	15.3
Fort Sill	(102)	58.8	15.5
Fort Jackson	(245)	54.7	16.2

TABLE 10
PERCENTAGES OF MALE ENLISTED PERSONNEL WITH AND WITHOUT
TRAINING DELAYS AND DISQUALIFICATIONS AND THEIR AVERAGE TWO-MILE RUN TIMES
BY SPORT PARTICIPATION

SPORT	NUMBER INDICATING PARTICIPATION	% WITHOUT TURNBACK OR DISQUALIFICATION	% LOW MOTIVATION PROBLEMS	% INJURY PROBLEMS	% PHYSICAL FITNESS PROBLEMS	TWO-MILE RUN TIME (MIN.)
Cross Country	323	72.8	5.0	7.1	1.5	14.7
Wrestling	540	70.2	8.0	5.9	2.6	15.1
Track	814	69.4	6.8	7.2	2.1	14.9
Football	1193	67.0	9.8	7.0	2.5	15.2
Swimming	619	64.6	9.4	7.8	3.4	15.3
Baseball	837	64.3	10.3	7.4	3.3	15.4
Basketball	829	64.3	11.7	6.9	3.7	15.2
Tennis	332	63.0	12.3	7.8	3.6	15.4
Softball	585	61.2	13.0	7.9	3.8	15.5
All male enlisted personnel	(N = 2072)	65.1	10.4	7.0	2.8	15.3

DISCUSSION

A close association of Airborne training success with physical performance is shown by the results of this research. Running is the physical fitness test event that best predicts Airborne training success. When other variables such as trainee sex; enlisted, officer or cadet status; or Advanced Individual Training Center were found to be related to success in Airborne training, these variables also were found to have strong parallel associations with running performance. Running performance appears to be a mediating variable which accounts for much of the sex, status, and training background differences in training success. In fact, the 30 percent difference in success rates for males and females was almost completely explained by differences in run time for the two groups where meaningful comparison was possible, males and females who ran at the same pace had virtually identical chances of success.

The results of this research indicate that if the current requirement for entry into Airborne training of 19 minutes seven seconds for the two-mile run were raised, the rate of failure in Airborne training would be substantially increased. Turnbacks and disqualifications in Airborne training are already likely if a trainee is only able to achieve this minimum of 60 points on the APFT two-mile run. This relatively poor runner is either failed specifically for his poor running, he develops a run-related injury or he fails for "low motivation." The first two categories are directly related to running requirements during Airborne training and the third category "low motivation" failures, while not necessarily directly related to running ability, is associated with it and individuals who will fall in that category may be predicted to some extent by their APFT run times.

These results also indicate that much of the attrition that occurs for poor runners might be eliminated with less emphasis on running during Airborne training. However, the differences shown in this study in Airborne training success for trainees from different AIT centers and the related differences in physical preparation, indicate that reduced attrition could also be achieved through increased emphasis on running, and other physical training, during AIT for Airborne-destined trainees. The fitness/running requirements for the Airborne combat mission would appear to be the proper basis for choosing one or the other method for reducing Airborne attrition for low-fitness trainees.

It would be presumptuous to say that research is needed to identify these fitness/running requirements for the Airborne combat mission. Nearly 40 years of Airborne combat and training operations have been well served by a strong emphasis on physical training and physical performance. Research would be of value, however, which accurately describes this relationship between soldier strength/endurance and Airborne mission accomplishment. Lessons learned on the battlefield about the performance of low and high fitness soldiers will be less available to training developers a generation later than documented research showing this relationship.

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APPENDIX A

ARI
Basic Data Form
AIRBORNE FITNESS/INJURY STUDY

Col

1

2-3

4-11

12-20

21-22

23-25

26-27

20-33

7. Men's scores (raw points)

34-36

37-39

40-42

43-45

46-49

50-53

54-56

57-59

60-62

63-65

66-69

33-67

70-71

72-73

6 6

7 7

74-75

Divorced 03

Other 04

76-77

CARD #? **

Col

13. Height in inches _____ 21-22
14. Weight in pounds _____ 23-25
15. Education (Number of completed years) _____ 26-27
(High School GED is equal to 12 years)
16. Component 28-29
- | | | |
|---------------|---------------------|---------------------|
| RA _____ 01 | Cadet _____ 05 | USN Cadet _____ 09 |
| NG _____ 02 | USMC _____ 06 | USAF _____ 10 |
| ER _____ 03 | USMC Cadet _____ 07 | USAF Cadet _____ 11 |
| USAR _____ 04 | USN _____ 08 | Foreign _____ 12 |
17. Source of commission 30-31
- | |
|--------------------------|
| OCS _____ 01 |
| ROTC _____ 02 |
| Service Academy _____ 03 |
| Direct _____ 04 |
18. Check the following sports which you participated in during High School or since: 32-42
- | | |
|---------------------|------------------------|
| 01 _____ Football | 06 _____ Wrestling |
| 02 _____ Basketball | 07 _____ Tennis |
| 03 _____ Baseball | 08 _____ Cross Country |
| 04 _____ Track | 09 _____ Softball |
| 05 _____ Swimming | |

** Copy data for columns 1 thru 20 from the front of this form.